PD - 93887D

International
IOR Rectifier

SMPS MOSFET

IRFR3704
IRFU3704

HEXFET® Power MOSFET

V_{DSS}	$R_{DS(on)}$ max	I_D
20V	9.5mΩ	75A

Applications

- High Frequency DC-DC Isolated Converters with Synchronous Rectification for Telecom and Industrial use
- High Frequency Buck Converters for Computer Processor Power
- 100% R_G Tested

Benefits

- Ultra-Low $R_{DS(on)}$
- Very Low Gate Impedance
- Fully Characterized Avalanche Voltage and Current

D-Pak IRFR3704   I-Pak IRFU3704

Absolute Maximum Ratings

Symbol	Parameter	Max	Units
V_{DS}	Drain-Source Voltage	20	V
V_{GS}	Gate-Source Voltage	± 20	
I_D @ T_C = 25°C	Continuous Drain Current, V_{GS} @ 10V	75 ④	A
I_D @ T_C = 70°C	Continuous Drain Current, V_{GS} @ 10V	63 ④	
I_{DM}	Pulsed Drain Current ①	300	
P_D @T_C = 25°C	Maximum Power Dissipation ③	90	W
P_D @T_A = 70°C	Maximum Power Dissipation ③	62	
	Linear Derating Factor	0.58	W/°C
T_J, T_{STG}	Junction and Storage Temperature Range	-55 to +175	°C

Thermal Resistance

Symbol	Parameter	Typ	Max	Units
$R_{\theta JC}$	Junction-to-Case ⑤	—	1.7	°C/W
$R_{\theta JA}$	Junction-to-Ambient (PCB Mount) *⑤	—	50	
$R_{\theta JA}$	Junction-to-Ambient ⑤	—	110	

* When mounted on 1" square PCB (FR-4 or G-10 Material) .
For recommended footprint and soldering techniques refer to application note #AN-994

Notes ① through ⑤ are on page 9

3/4/04

Static @ T_J = 25°C (unless otherwise specified)

Symbol	Parameter	Min	Typ	Max	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	20	–––	–––	V	V_{GS} = 0V, I_D = 250μA
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	–––	0.021	–––	V/°C	Reference to 25°C, I_D = 1mA
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	–––	7.3	9.5	mΩ	V_{GS} = 10V, I_D = 15A ③
		–––	11	14		V_{GS} = 4.5V, I_D = 12A ③
$V_{GS(th)}$	Gate Threshold Voltage	1.0	–––	3.0	V	V_{DS} = V_{GS}, I_D = 250μA
I_{DSS}	Drain-to-Source Leakage Current	–––	–––	10	μA	V_{DS} = 20V, V_{GS} = 0V
		–––	–––	100		V_{DS} = 16V, V_{GS} = 0V, T_J = 125°C
I_{GSS}	Gate-to-Source Forward Leakage	–––	–––	200	nA	V_{GS} = 16V
	Gate-to-Source Reverse Leakage	–––	–––	-200		V_{GS} = -16V

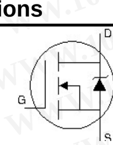
Dynamic @ T_J = 25°C (unless otherwise specified)

Symbol	Parameter	Min	Typ	Max	Units	Conditions
g_{fs}	Forward Transconductance	42	–––	–––	S	V_{DS} = 25V, I_D = 57A
Q_g	Total Gate Charge	–––	19	–––	nC	I_D = 28.4A
Q_{gs}	Gate-to-Source Charge	–––	8.1	–––		V_{DS} = 10V
Q_{gd}	Gate-to-Drain ("Miller") Charge	–––	6.4	–––		V_{GS} = 4.5V ③
Q_{OSS}	Output Gate Charge	–––	16	24		V_{GS} = 0V, V_{DS} = 10V
R_G	Gate Resistance	0.3	–––	3.2	Ω	
$t_{d(on)}$	Turn-On Delay Time	–––	8.4	–––	ns	V_{DD} = 10V
t_r	Rise Time	–––	98	–––		I_D = 28.4A
$t_{d(off)}$	Turn-Off Delay Time	–––	12	–––		R_G = 1.8Ω
t_f	Fall Time	–––	5.0	–––		V_{GS} = 4.5V ③
C_{iss}	Input Capacitance	–––	1996	–––	pF	V_{GS} = 0V
C_{oss}	Output Capacitance	–––	1085	–––		V_{DS} = 10V
C_{rss}	Reverse Transfer Capacitance	–––	155	–––		ƒ = 1.0MHz

Avalanche Characteristics

Symbol	Parameter	Typ	Max	Units
E_{AS}	Single Pulse Avalanche Energy②	–––	216	mJ
I_{AR}	Avalanche Current ①	–––	71	A

Diode Characteristics

Symbol	Parameter	Min	Typ	Max	Units	Conditions
I_S	Continuous Source Current (Body Diode)	–––	–––	75 ④	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I_{SM}	Pulsed Source Current (Body Diode) ①	–––	–––	300		
V_{SD}	Diode Forward Voltage	–––	0.88	1.3	V	T_J = 25°C, I_S = 35.5A, V_{GS} = 0V ③
		–––	0.82	–––		T_J = 125°C, I_S = 35.5A, V_{GS} = 0V ③
t_{rr}	Reverse Recovery Time	–––	38	57	ns	T_J = 25°C, I_F = 35.5A, V_R = 20V
Q_{rr}	Reverse Recovery Charge	–––	45	68	nC	di/dt = 100A/μs ③
t_{rr}	Reverse Recovery Time	–––	41	62	ns	T_J = 125°C, I_F = 35.5A, V_R= 20V
Q_{rr}	Reverse Recovery Charge	–––	50	75	nC	di/dt = 100A/μs ③

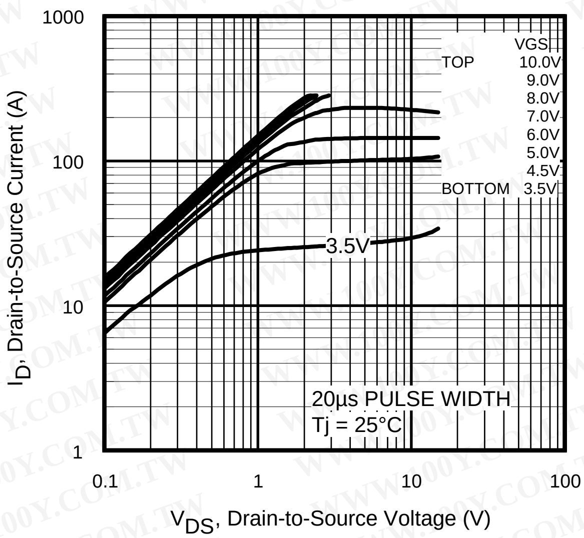


Fig 1. Typical Output Characteristics

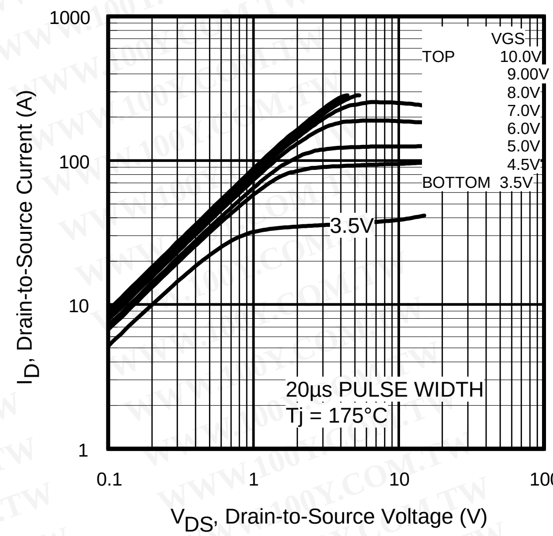


Fig 2. Typical Output Characteristics

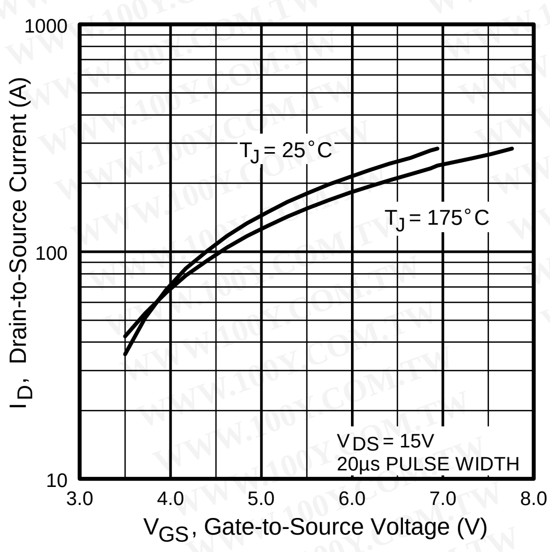


Fig 3. Typical Transfer Characteristics

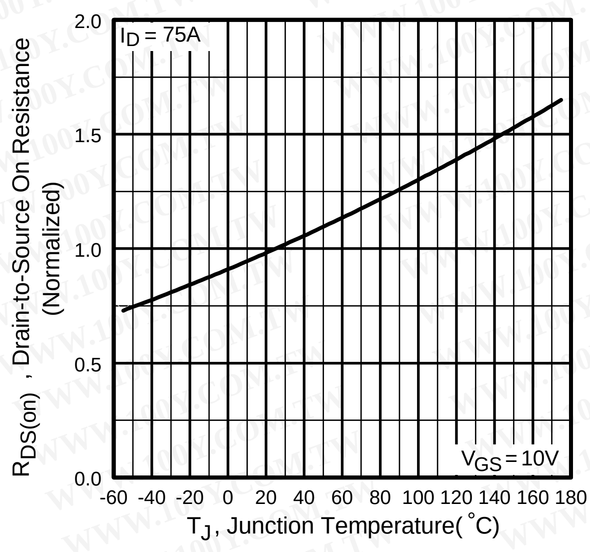


Fig 4. Normalized On-Resistance Vs. Temperature

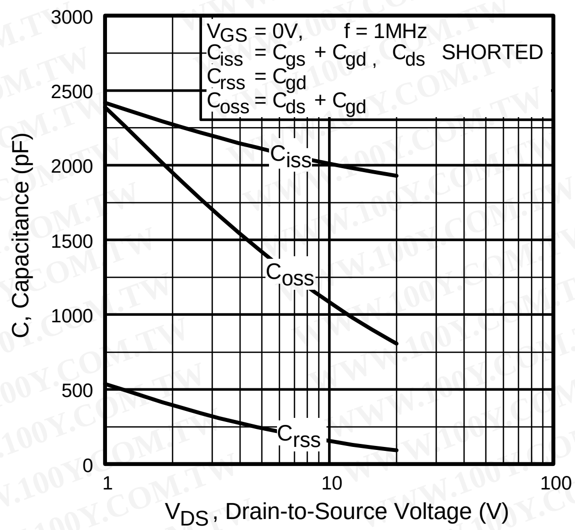


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

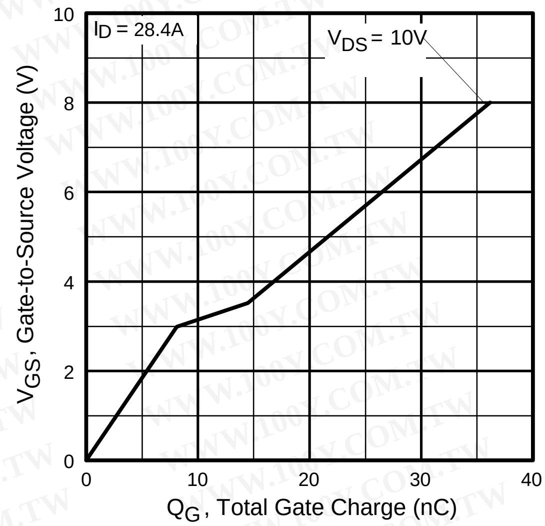


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

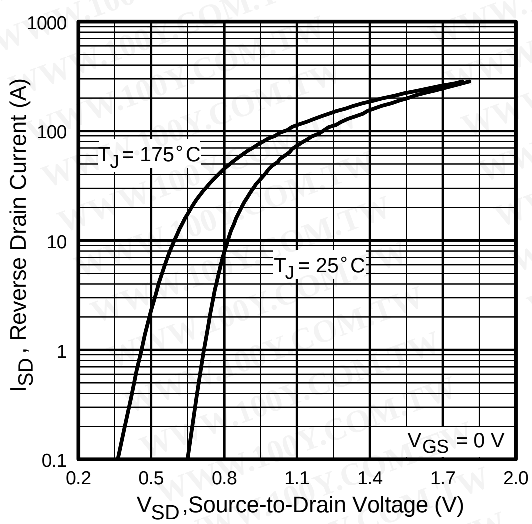


Fig 7. Typical Source-Drain Diode Forward Voltage

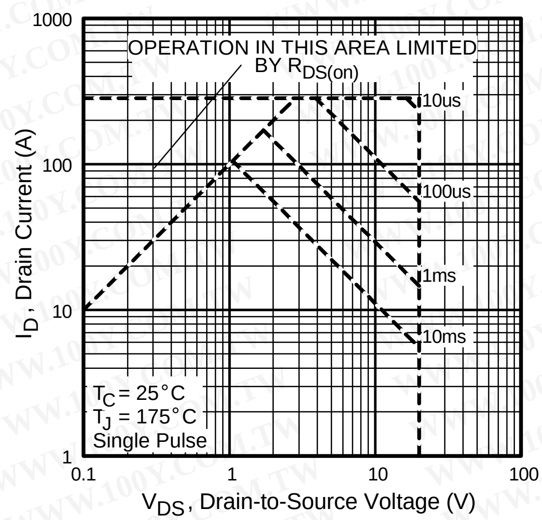


Fig 8. Maximum Safe Operating Area

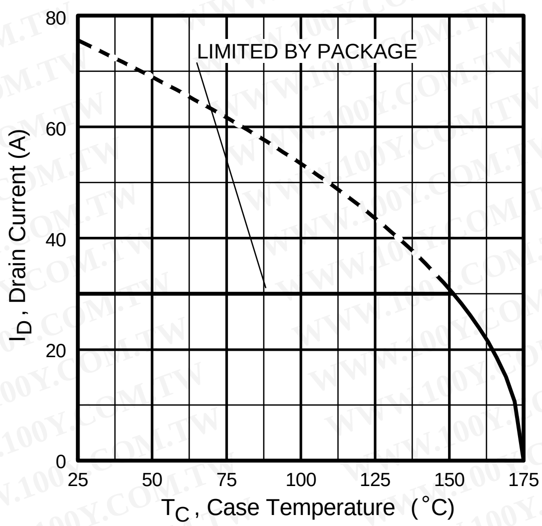


Fig 9. Maximum Drain Current Vs. Case Temperature

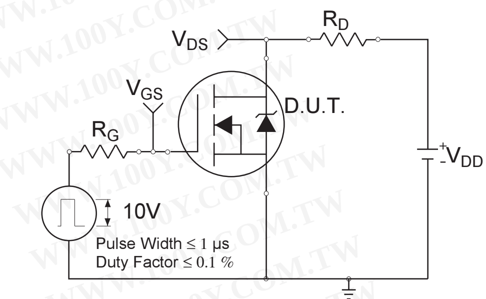


Fig 10a. Switching Time Test Circuit

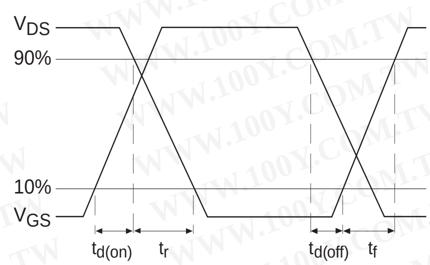


Fig 10b. Switching Time Waveforms

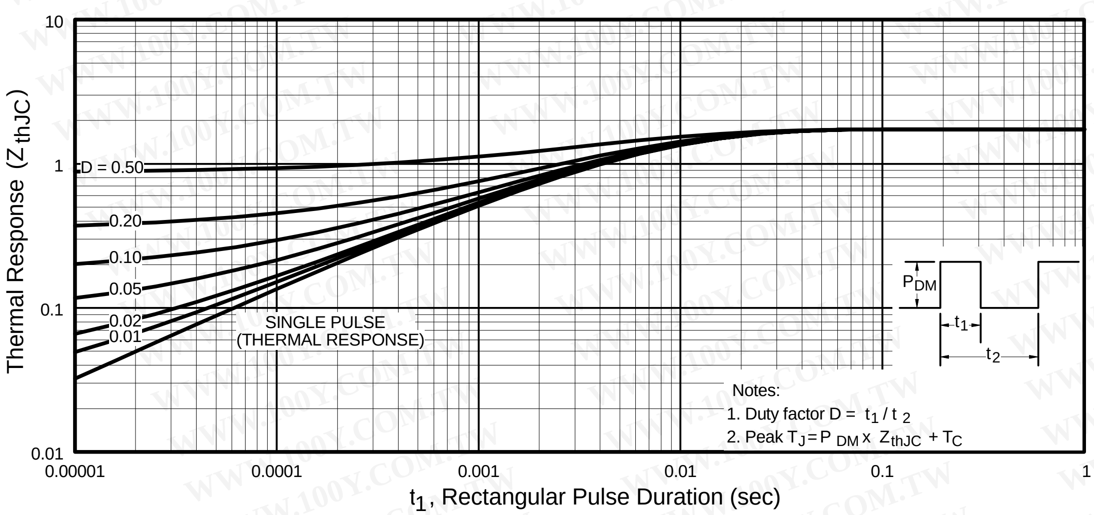


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

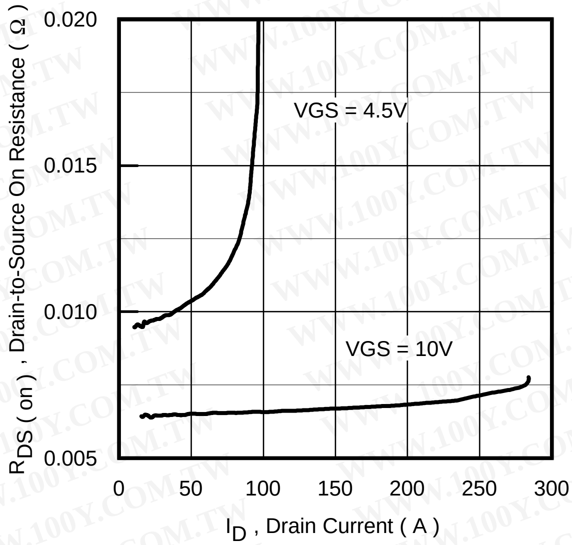


Fig 12. On-Resistance Vs. Drain Current

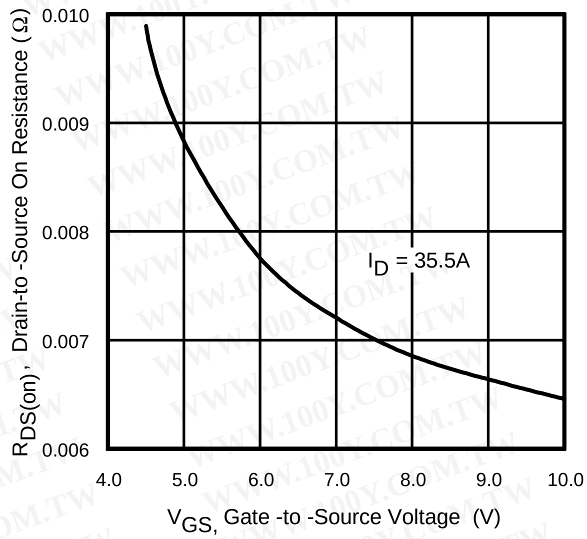


Fig 13. On-Resistance Vs. Gate Voltage

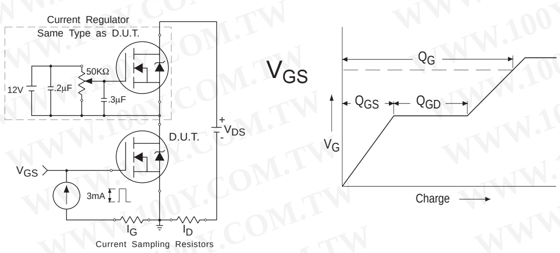
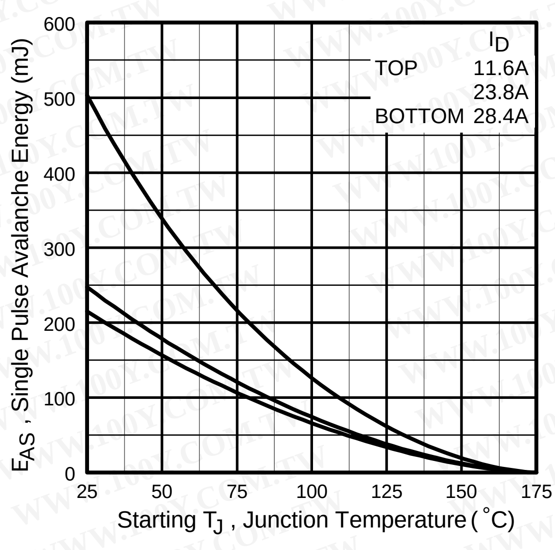


Fig 14a&b. Basic Gate Charge Test Circuit and Waveforms



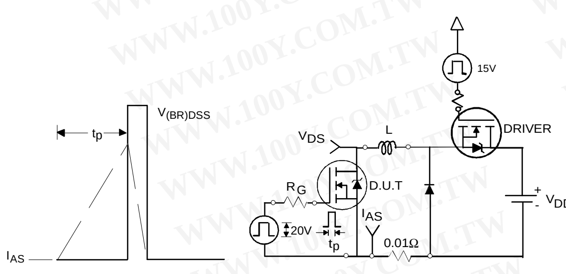
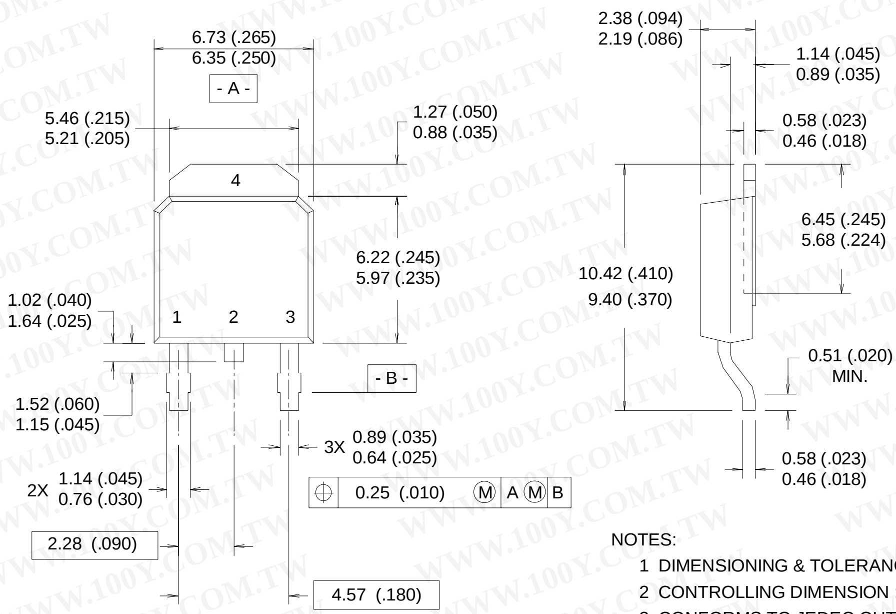


Fig 15a&b. Unclamped Inductive Test Circuit and Waveforms

Fig 15c. Maximum Avalanche Energy Vs. Drain Current

D-Pak (TO-252AA) Package Outline

Dimensions are shown in millimeters (inches)

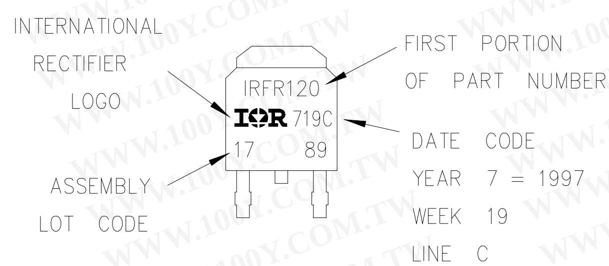


LEAD ASSIGNMENTS
1 - GATE
2 - DRAIN
3 - SOURCE
4 - DRAIN

NOTES:
1 DIMENSIONING & TOLERANCING PER ANSI Y14.5M, 1982.
2 CONTROLLING DIMENSION : INCH.
3 CONFORMS TO JEDEC OUTLINE TO-252AA.
4 DIMENSIONS SHOWN ARE BEFORE SOLDER DIP, SOLDER DIP MAX. +0.16 (.006).

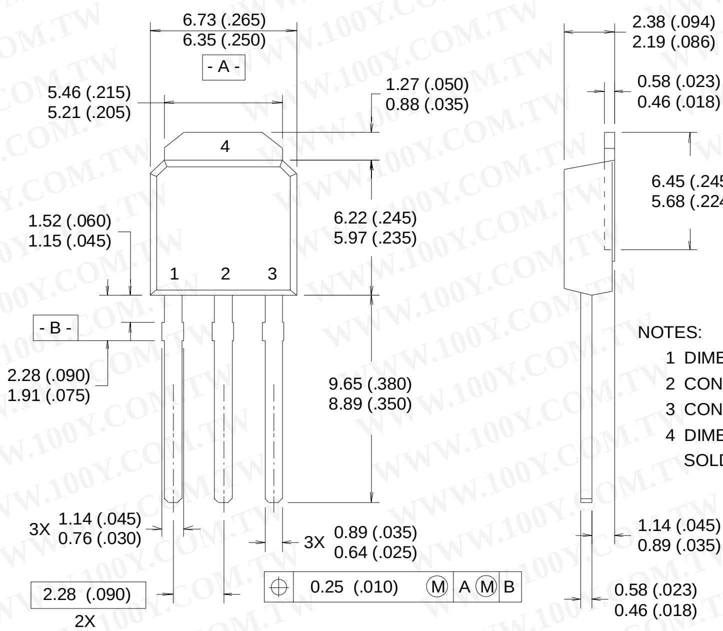
D-Pak (TO-252AA) Part Marking Information

EXAMPLE: THIS IS AN IRFR120
LOT CODE 1789
ASSEMBLED ON WW 19, 1997
IN THE ASSEMBLY LINE "C"



I-Pak (TO-251AA) Package Outline

Dimensions are shown in millimeters (inches)

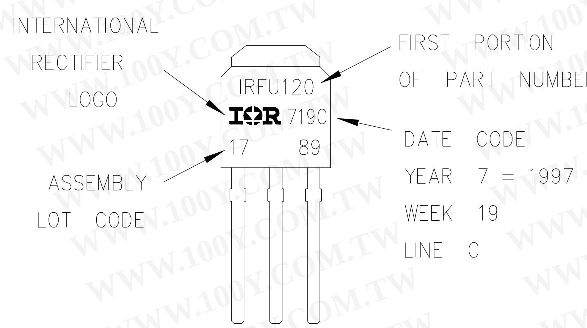


LEAD ASSIGNMENTS
1 - GATE
2 - DRAIN
3 - SOURCE
4 - DRAIN

NOTES:
1 DIMENSIONING & TOLERANCING PER ANSI Y14.5M, 1982.
2 CONTROLLING DIMENSION : INCH.
3 CONFORMS TO JEDEC OUTLINE TO-252AA.
4 DIMENSIONS SHOWN ARE BEFORE SOLDER DIP, SOLDER DIP MAX. +0.16 (.006).

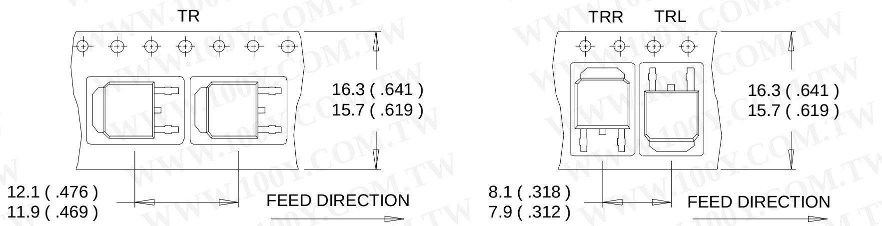
I-Pak (TO-251AA) Part Marking Information

EXAMPLE: THIS IS AN IRFU120
LOT CODE 1789
ASSEMBLED ON WW 19, 1997
IN THE ASSEMBLY LINE "C"

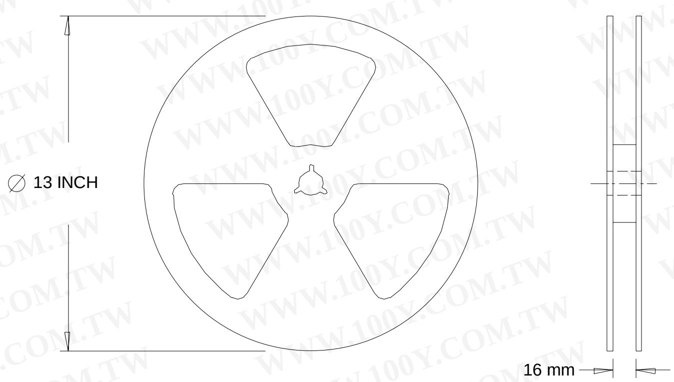


D-Pak (TO-252AA) Tape & Reel Information

Dimensions are shown in millimeters (inches)



NOTES :
1. CONTROLLING DIMENSION : MILLIMETER.
2. ALL DIMENSIONS ARE SHOWN IN MILLIMETERS (INCHES).
3. OUTLINE CONFORMS TO EIA-481 & EIA-541.



NOTES :
1. OUTLINE CONFORMS TO EIA-481.

Notes:

① Repetitive rating; pulse width limited by max. junction temperature.

② Starting T_J = 25°C, L = 0.5 mH R_G = 25Ω, I_{AS} = 28.4 A.

③ Pulse width ≤ 300µs; duty cycle ≤ 2%.

④ Calculated continuous current based on maximum allowable junction temperature. Package limitation current is 30A

⑤ R_θ is measured at T_J approximately 90°C

Data and specifications subject to change without notice.
This product has been designed and qualified for the Industrial market.
Qualification Standards can be found on IR's Web site.

International IOR Rectifier

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